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Detection

# INSTRUCTIONS FOR REPLANNING A DETECTION SYSTEM ON THE NATIONAL FORESTS of REGION THREE

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# Instructions for Replanning a Fire Detection System on the National Forests of Region 3

Objectives:

1. To determine the efficiency of an existing detection system with respect to Regional Fire Detection Standards.

2. To make necessary additions to a fire detection system that does not meet Regional Fire Detection Standards.

3. To economically develope a detection system, that meets Regional Fire Detection Standards, by making lookout eliminations if necessary.

4. To determine as accurately as possible the best conbination of primary and, if necessary, emergency type lookouts to give the desired coverage at each fire danger rating, during the different fire seasons.

Regional Detection Standards

The "Primary Lookout", in the Southwestern Region, is defined as, "a permanent lookout station that is normally manned, primarily for detection purposes, continuously throughout the major part of the regular fire season."

When all primary lookouts are occupied a replanned fire detection system, subject to economic principles, should achieve a minimum net seen area percent coverage of:

A. For the HH* Fuel Type

| | | | | | |
|---|---|---|---|---|---|
| 85 | percent | for | occurrence | zone | 1 |
| 80 | " | " | " | " | 2 |
| 70 | " | " | " | " | 3 |
| 65 | " | " | " | " | 4 |
| 55 | " | " | " | " | 5 |

B. For the MM, EL, and LM Fuel Types**

| | | | | | |
|---|---|---|---|---|---|
| 75 | percent | for | occurrence | Zone | 1 |
| 70 | " | " | " | " | 2 |
| 65 | " | " | " | " | 3 |
| 60 | " | " | " | " | 4 |
| 50 | " | " | " | " | 5 |

* The HH fuel type includes slash except in grass and dense stands of brush and chapparal.

** Includes all ground fuels in the Ponderosa Pine type except slash, extensive areas of dense reproduction and/or snags.
Mixed Conifer - All ground fuels except slash.
Woodland - All ground fuels except slash.
Brush - The high elevation deciduous oak type of brush.

C. For all fuel types in areas of definite man-caused risk*

| | | | | | |
|---|---|---|---|---|---|
| 85 | Percent | for | occurrence | zone | 1 |
| 80 | " | " | " | " | 2 |
| 70 | " | " | " | " | 3 |
| 65 | " | " | " | " | 4 |
| 55 | " | " | " | " | 5 |

Methodology

Much can be learned of the efficiency of a detection system by studying first discoveries, detection time and the percent of total fires discovered by lookouts. For replanning purposes, however, such studies are of limited value. To properly replan a fire detection system, statistical methods must be employed. The instructions following this introduction describe the planimeter method of analyzing a fire detection system in the Southwest. While these instructions are reasonably complete many small details are left to the planner to decide for himself.

Part One Plotting Fire Occurrence

Before specific statistical information about a fire detection system can be gathered it is necessary to establish the occurrence pattern of a forest. Enough fires must be plotted to determine this pattern with reasonable accuracy. Therefore, the previous ten years man and lightning caused fire record for the Apache, Coconino, Gila, Kaibab, Sitgreaves and Tonto National Forests will be used. For the balance of the forests a twenty year record for lightning fires and a ten year record for man-caused fires will be used.

Place the points of origin of the actual fire occurrence on a ½ inch scale fuel type map of the forest, based on the revised 1953 fuel type classification, as follows:

A. Lightning Fires:

Class A & B - Green dots (Mongol No. 868 or equiv.)
Class C - Orange dots (Mongol No. 862 or equiv.)
Class D - Purple dots (Dixon No. 396 or equiv.)
Class E - Red dots (Mongol No. 866 or equiv.)

B. Man-caused Fires:

Using the same color code as for lightning fires, make a colored cross with a black circle around it to identify man-caused fires. All fires occurring inside the forest boundary and any fires starting outside the forest but presenting an immediate threat to

* Man-caused risk areas, as a minimum, should have a man-caused occurrence intensity equal to occurrence zone 4 or 1-3 man-caused fires per year. Note that the zone itself is still based upon total occurrence.

the forest, are to be included. Man-caused fires started by risks no longer in existence, should be excluded from the fire occurrence map.

Part Two Zoning Fire Occurrence

The plotted fire occurrence will not be uniform over the entire forest. Certain areas will have more fires per unit of area than others. Before lookouts can be fairly compared with each other it is necessary to place the plotted man-caused and lightning caused fires into zones of nearly equal fire occurrence intensity.

Occurrence Intensity is defined as the number of fires (lightning and man-caused) per thousand acres for 10 years.

The intensity intervals to be used in Region Three for determining fire occurrence zones are as follows:

| Occurrence Zone | Intensity Interval |
|---|---|
| 1 | 10.1 & over |
| 2 | 5.1 - 10 |
| 3 | 3.1 - 5 |
| 4 | 1.0 - 3.0 |
| 5 | 0.1 - 0.9 |
| None | 0.1 & less |

The placement of the plotted fire occurrence into zones of nearly equal intensity involves a varying amount of guess work and trial and error. Some areas will have sharply defined occurrence intensity and little guess work will be necessary to properly zone them. Other areas will have different occurrence intensity but the break between them will not be distinct. It then becomes necessary for the planner to determine, by trial and error, where one zone ends and the other begins.

The Method of Zoning Fire Occurrence

Step A

Areas of highest intensity should be considered first in zoning occurrence, then continue to areas of lesser intensity until all occurrence has been zoned.*

Select an area of high occurrence intensity and draw a light pencil line around it. Since we are zoning areas of occurrence intensity rather than the occurrence itself, we must assume that fires will occur with nearly equal intensity over the general area in question. For this reason, do not draw this line too close to any occurrence dots. Stay approximately one-half mile away from them. Do not indent

* Procedure for zoning fire occurrence is similar to the approach used in typing timber density on aerial photographs.

the zone line to extremes.

Planimeter the area included within this line and calculate its area to the nearest one thousand acres.

Step B

Count the number of fires (lightning and man-caused, all classes) within this area. Since the occurrence intensity calculation is made on a ten year basis it is necessary, at this point, for those forests using a twenty year record for lightning fires to count each of these as one-half a fire.

Step C

Divide the number of fires counted, by the acres in the area divided by 1,000. Carry the division to the first decimal place or nearest tenth. The figure thus obtained is the fire occurrence intensity for the area in fires per one thousand acres for ten years.

Example: 30 fires on an area of 5,000 acres
is an occurrence intensity of 6.0.

$$\frac{30 \text{ fires}}{5 \text{ M acres}} = 6.0 \text{ fires per M acres for 10 yrs.}$$

$$= \text{Occurrence Zone 2}$$

Step D

If the occurrence intensity zoned in steps A-C above is sharply defined, i.e., the break between it and an area of lower intensity is definite and easily determined, little readjustment is necessary. Any adjustment that may be made is based on the calculated intensity for the area and then only if this figure is near the upper or lower limits of an intensity interval.

For Example: Assume a calculated intensity of 10.0 fires per thousand acres for ten years based on an area of twenty thousand acres. This would put the area in Occurrence Zone 2. However, Zone 1 starts at 10.1 and the planner must decide, according to each individual case, whether to leave the zone as is or to shave a few of the acres from it (by adjusting the pencil line inward) to put it in the higher zone. A high number of C, D and E fires, together with a large acreage of high occurrence, may justify the inclusion of this area in Zone 1 instead of the calculated Zone 2.

Conversely, if the calculated occurrence was 10.1 instead of 10.0 a decision should be made as to whether to leave the area in Zone one or to add a few acres (by adjusting the pencil line outward) and lower it to Zone two. These decisions are not limited to Zones one and two, but are usually necessary for all occurrence zones.

Step E

In addition to the procedure outlined under Step D, further adjustment may be necessary. When the occurrence intensity zoned in steps A-C is not sharply defined, i.e., the break between it and an area of lower intensity is not definite and easily determined, then the original pencil line will usually have to be adjusted. As in step D the calculated intensity is used as a base for the decisions but in this case the adjustment involves a certain amount of guess work and trial and error.

The objective is to extend or retract the pencil line in such a way as to include an area of nearly equal fire occurrence intensity. In some cases the planner will find that one large area of equal intensity will be better than two smaller areas of different intensities, while in others the reverse will be true. No hard and fast rules can be laid to cover this adjustment. The planner will have to think out each case on its own merits. Just remember, don't be too detailed. Think of the zoning job in general terms. Your zone map will be much simpler, easier to use and still serve its purpose.

Step F

When a zone boundary has been definitely established, replace the pencil line with a red one. (Mongol No. 868 or equivalent). Then label each zone in pencil as in the example below.

Example: A zone of nearly equal intensity involving 15,000 acres and 45 fires with an occurrence intensity of 3.0 would be labeled 15-45-3.0.

Step G

Color each zone with the colors listed.

| | |
|---|---|
| Zone 1 | Brown (Dixon No. 378 or equiv.) |
| Zone 2 | Purple (Mongol No. 296 or equiv.) |
| Zone 3 | Blue (Mongol No. 865 or equiv.) |
| Zone 4 | Orange (Mongol No. 862 or equiv.) |
| Zone 5 | No color |

The completed map is called an "Occurrence Zone Map" and should be labeled as such.

Step H

After the occurrence for a forest is properly zoned, a pencil total for each zone must be made. After this total is made, divide the number of fires in each zone by its acreage. The figure resulting from this division is the average intensity for each Occurrence Zone. This figure is termed the "Weight Value" and will be used in all later calculations, with the exception of zone 5.

Zone 5 is of such low occurrence that it is given a uniform weight value of 0.25. A summary table should be made to show the data for each zone as in table No. 1.

Table No. 1. From Gila Replanning Report.

| Lookout Combination | Occurrence Zones, Acres | | | | | Discovery Index |
|---|---|---|---|---|---|---|
| | Zone 2: | Zone 3: | Zone 4: | Zone 5: | Total: | |
| Holt & Grouse: | 3,000 | 5,000 | 6,000 | 7,000 | 21,000: | 43.95 |
| Grouse & Spgs: | 1,000 | 4,000 | 11,000 | 11,000 | 27,000: | 36.95 |
| Holt & Spring: | 3,000 | 7,000 | 14,000 | 16,000 | 40,000: | 64.90 |

Part 3. Determination of Discovery Index on a Gross Seen-Area Basis

Before continuing with this part of the study it is necessary to make a seen-area overlay for each lookout in the system (including lookouts from other forests). Using the seen-area maps available on the forests, trace on acetate or other similar transparent material the 0 - 15 mile seen-area of each lookout. Place an X on the overlay to mark the location of the lookout and trace two inter-secting section lines near the X so the overlay may be oriented quickly on the occurrence zone map. Lightly color (red works fine) this seen-area. These seen-area maps have been found to be accurate within the limits necessary for this study. Note that the seen-area to be used in this study was limited to fifteen miles. Even though good men can usually detect fires at greater distances, the safe limit on most Region Three forests is fifteen miles. (Possibly on the Lincoln National Forest fifteen miles would be too great a distance). In all such cases the limits must be adjusted to fit local conditions. Certain decisions, as will be shown later, may depend on the seen-area over fifteen miles, but for the replanning study proper, the limit is fifteen miles.

We can now determine the gross seen-area and gross Discovery Index of each lookout. The procedure is as follows:

Step A

Place the seen-area overlay of a lookout in its proper position on the Occurrence Zone Map. Trace the boundaries of each occurrence zone, that appear in the seen-area of the lookout, on the overlay. There is no minimum size limit to this step. Trace all areas on the overlay no matter how small. Make sure each area is correctly labeled with its proper zone classification.

Step B

Planimeter the areas on the overlay in each occurrence zone. After a few of the smaller areas have been planimetered and the relation between size and readings has been fixed in mind, then other like

areas may be estimated to save time. With periodic planimeter checking, accuracy will be maintained. Also on certain seen-area overlays drainages will form a detailed maze type pattern. In cases of this type it is permissible to smooth off (using a pencil, do not erase) some of the more wavy lines to simplify planimetering but do not carry this to extremes. Record the planimeter readings by occurrence zones but do not convert each reading to acres. Rather, when the planimetering is completed for the overlay, add all the readings for each zone, get one figure, convert it to acres and round it off to the nearest thousand acres. The minimum total area of a zone credited to a lookout will be five hundred acres for Zones 1 and 2 and one thousand acres for Zones 3, 4 and 5.

Step C

Make pencil summary sheet for each lookout using the figures determined in Step B as in the example given in table No. 2.

Table 2. Granite Peak - Gila National Forest
0-15 Mile Gross Seen-Area and Discovery Index

| Occurrence Zone | Seen-Area acres | Weight Value | Total Weight | Discovery Index |
|---|---|---|---|---|
| 1 | none | - | - | - |
| 2 | 25,000 | 5.10 | 127,500 | 127.5 |
| 3 | 1,000 | 3.70 | 3,700 | 3.7 |
| 4 | 74,000 | 1.40 | 103,600 | 103.6 |
| 5 | 40,000 | 0.25 | 10,000 | 10.0 |
| Total | 140,000 | - | 244,800 | 244.8 |

The total weight is determined by multiplying the seen-area in each zone by the weight value for that zone. Discovery Index is determined by dividing the Total Weight by one thousand. Discovery Index indicates the potential number of fires, within a fifteen mile radius, that could have been discovered from a lookout in the past ten years had it been manned. In the sample cited, Granite Peak could have averaged 24.48 fire per year. This procedure should be followed for each Lookout in the system.

Step D

A summary of the gross seen-area and gross Discovery Index of all lookouts should then be made as in Table No. 3..

This summary is only one step toward the final results of this study. It is necessary in replanning a fire detection system, but is of only limited value in that it compares lookouts on a gross seen-area basis only. It shows the seen-area and Discovery Potential of each lookout as if it were the only one in the system. The summary does not consider overlapping seen-area. In order to arrive at a correct ranking of lookouts they must be studied from a net-seen-area viewpoint.

Table No. 3. The 0 - 15 Mile Gross Seen-Area of the Lookouts on the Gila National Forest by Occurrence Zones, Ranked by the Gross Discovery Index for each.

| Lookout | 0 - 15 Mile Seen-Area by Occurrence Zones (Acres) | | | | | Discovery Index (Gross) |
|---|---|---|---|---|---|---|
| | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Total | |
| 1. Granite Pk. | 25,000 | 1,000 | 74,000 | 40,000 | 140,000 | 244.8 |
| 2. Eagle Peak * | - | 22,000 | 85,000 | 36,000 | 143,000 | 209.4 |
| 3. Black Mtn. | 11,000 | 5,000 | 64,000 | 38,000 | 118,000 | 173.7 |
| 4. Mogollon Baldy | 12,000 | 7,000 | 50,000 | 22,000 | 91,000 | 162.6 |
| 5. Bearwallow | 500 | 9,000 | 86,000 | 1,000 | 96,500 | 156.5 |
| 6. Signal Peak | 16,000 | - | 24,000 | 18,000 | 58,000 | 119.7 |
| 7. Negrito Mtn. | 500 | 3,000 | 74,000 | - | 77,500 | 107.2 |
| 8. Spring Mtn. | 2,000 | 6,000 | 28,000 | 11,000 | 47,000 | 74.4 |
| 9. Boiler Pk. | - | 8,000 | 10,000 | 38,000 | 56,000 | 53.1 |
| 10. Lookout Mtn. | - | 10,000 | 2,000 | 48,000 | 59,000 | 51.8 |
| 11. Holt Mtn. | 4,000 | 3,000 | 6,000 | 7,000 | 20,000 | 41.7 |
| 12. Grouse Mtn. | 1,000 | 5,000 | 10,000 | 7,000 | 23,000 | 39.3 |
| 13. Diamond Pk. | - | 5,000 | 7,000 | 23,000 | 35,000 | 34.0 |
| 14. Reeds Pk. | - | - | 21,000 | 12,000 | 33,000 | 32.4 |
| 15. Hillsboro | - | - | 15,000 | 11,000 | 26,000 | 22.8 |

* On Gila - Apache boundary. Administration is by the Apache National Forest.

Part 4. Determination of Discovery Index on a Net Seen-Area Basis.

Thus far each lookout has been considered as a separate entity. Now it becomes necessary to consider them together as a unit and in competition with each other for gross seen-area. The objective being to rank all lookouts in a fire detection system in descending order according to their Net Discovery Indexes. This should be done in the manner described below.

Step A

Start with the lookout with the highest Gross Discovery Index from table No. 3. This lookout is used as a base because, according to calculations, it has a better chance of discovering more fires than any others. (Care should be taken in this step since the elimination of seen-area by the addition of lower ranked lookouts may reduce the net-seen area of rhe higher ranked lookout to a point where it contributes little to the overall fire detection system.) The overlay for the lookout with the highest Gross Discovery Index is then placed on the Fire Occurrence Zone map in its proper position.

Step B

Place the overlay for the lookout with the next highest Gross Discovery Index on the Fire Occurrence Zone Map. Since net seen-area and Discovery Index is being calculated, any area seen by lookout number two that is also seen by lookout number one cannot be credited to lookout two. It is, therefore, necessary to deduct from lookout number two any area that is also seen from lookout number one. This deduction is made in pencil on the overlay of the lookout which loses the area.

Step C

Replanimeter the seen-area of the second lookout after the deduction has been made and recalculate its seen-area and Discovery Index as in steps A through C. The figures thus determined are the net seen-areas and not discovery indexes for the second lookout. Since the first lookout was used as a starting point its gross and net seen-areas and discovery indexes will be identical.

Step D

The overlay for the lookout with the third highest Gross Discovery Index is then placed on the Occurrence Zone Map. Any area seen by the first two lookouts cannot be credited to the third and is therefore deducted from it. The seen-area and Discovery Index for lookout number three is then recalculated as in step C above. This is continued until the net seen-area and net discovery index is determined for all the lookouts in the system. It is suggested that the area deducted from a lookout be crosshatched and identified. For example: The gross seen-area of some lookouts may be reduced by morethan one other lookout; the area deducted from it should be cross hatched differently and identified for each lookout causing the deduction. In later analysis this information will prove valuable.

Though it is seldom the case, it is entirely possible that some of the high ranked lookouts in table 2 will have their net seen-areas theoretically reduced by the subsequent addition of other lower ranked lookouts to a point where they are not contributing much to the net seen-area of the system.

For Example: Most of the gross seen-area of a lookout with a very high gross Discovery Index may be seen by two or more other lookouts of lesser gross Discovery Indexes. Under these conditions, it may be that the net Discovery Index of the higher ranked lookout will actually be less than that of any or all of the others. When this is the case, the high ranked lookout should not be placed ahead of the others in the statistical competition just described. Instead it should be placed in its proper position, on a net seen-area basis, in the order of the lookouts. As stated above, the objective here is to place the lookouts in exact descending order of actual Net Discovery Index.

In situations of this kind, the extra work which would be involved in correcting the error by backing up and redoing the calculations for all the lookouts involved, may be avoided by making some simple preliminary comparisons. In most cases this preliminary comparison will be nothing more than a visual check using the seen-area overlays of the lookouts in question. This visual check will usually reveal which lookout will have the highest net Discovery Index after the calculations are made. In doubtful cases, however, it may be necessary to do some planimetering and make rough calculations to determine which lookout to use. In any case these preliminary calculations, if done correctly, will save the planner subsequent extra work.

Step E

As in Step D, Part 3, a summary of the net seen-area and Discovery Index for all lookouts should be made. This will be table Number 4. A sample is shown below to illustrate how the Discovery Index and seen-area will change when based on net instead of gross acres and how the percent coverage for the occurrence zones is calculated. Notice how the ranking of the lookouts shown in Table No. 3, has changed, as for example Black Mountain. This lookout dropped from third to fifth place in rank; its acres from 118,000 gross to 71,000 net and its Discovery Index from 173.7 to 76.7. Notice also, that after 8 lookouts have been added to the system the Discovery Index takes a sharp drop and continues downward indicating a diminishing return for each additional lookout.

Table No. 4. The 0-15 Mile Net Seen-Area coverage of All Fuel.

Types by the Lookouts on the Gila National Forest by Occurrence Zones, ranked according to the Net Discovery Index for each lookout.

| Lookouts | 0 - 15 15 mile Seen-area by Occurrence Zones (acres) | | | | | Net Discovery Index |
|---|---|---|---|---|---|---|
| | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Total | |
| 1. Granite Pk. | 25,000 | 1,000 | 74,000 | 40,000 | 140,000 | 244.8 |
| 2. Eagle Pk | - | 22,000 | 85,000 | 36,000 | 143,000 | 209.4 |
| 3. Mogollon Baldy | 7,000 | 7,000 | 33,000 | 21,000 | 68,000 | 113.1 |
| 4. Signal Pk. | 13,000 | - | 22,000 | 18,000 | 53,000 | 101.6 |
| 5, Black Mtn. | 1,000 | 4,000 | 35,000 | 31,000 | 71,000 | 76.7 |
| 6. Bearwallow | - | 4,000 | 29,000 | 1,000 | 34,000 | 55.7 |
| 7. Lookout Mtn. | - | 10,000 | 2,000 | 42,000 | 54,000 | 50.3 |
| 8. Spring Mtn. | 1,000 | 5,000 | 14,000 | 11,000 | 31,000 | 46.0 |
| 9. Reeds Pk. | - | - | 19,000 | 12,000 | 31,000 | 29.6 |
| 10. Negrito Mtn. | - | 1,000 | 13,000 | - | 14,000 | 21.9 |
| 11. Hillsboro | - | - | 13,000 | 10,000 | 23,000 | 20.7 |
| 12. Holt Mtn. | 2,000 | 2,000 | - | 5,000 | 9,000 | 18.9 |
| 13. Boiler | - | 1,000 | 8,000 | 13,000 | 22,000 | 18.2 |
| 14. Diamond Pk. | - | 1,000 | 5,000 | 3,000 | 9,000 | 11.5 |
| 15. Grouse Mtn. | - | - | 2,000 | 1,000 | 3,000 | 3.0 |
| Total Seen-Area | 49,000 | 58,000 | 354,000 | 244,000 | 705,000 | |
| Total to be seen | 70,000 | 74,000 | 563,000 | 467,000 | 1,174,000 | |
| Percent seen | 70% | 78% | 63% | 52% | 60% | |

Step F

When areas of HH fuel type (1954 revised fuel type classification) are present in the occurrence zones of a forest, it is necessary to make a summary table of the net seen-area coverage of these fuel

types. To gather the necessary data for this table the procedure outlined below should be followed.

1. Place the net seen-area overlay of the first ranked lookout in table No. 4 on the Occurrence Zone Map. Planimeter and record the area this lookout sees in these fuel types by occurrence zones.

2. Do the same for lookout No. 2 but do not count areas in these fuel types seen by lookout Number 1. (These areas are already deducted and cross-hatched, step D). Planimeter and record these areas as in No. 1 above.

3. Follow this procedure for each lookout listed in table No. 4 in the order in which they appear.

4. Determine the total area of these fuel types in the net seen-area of all lookouts by occurrence zones.

5. Determine the total area of these fuel types in the occurrence zones of the forest.

Place the data gathered in the above steps in a table having the same form, but excluding the Discovery Index column, as table No. 4, but with the following title:

Table No. 5. The 0 - 15 Mile Net Seen-Area coverage of HH Fuel Types by the Lookouts on the _____ National Forest by Occurrence Zones.

NOTE - Place the lookouts in the same order as in Table 4.

Step G

When areas of definite man-caused risk are present on a forest it is necessary to make a summary table of the net seen-area coverage of these areas. The data for this table is gathered in the same manner as in step F above. Of course, the man-caused risk areas will have to be defined on the occurrence zone map before the data can be gathered. The summary table for this data has the same form as table No. 5 with the exception of the title which is changed to:

Table No. 6. The 0 - 15 Mile Net Seen-Area Coverage of Definite Man-Caused Fire Risk Areas in All Fuel Types by the Lookouts on the _____ National Forest, by Occurrence Zones.

Step H

The data in the HH fuel type summary, Table No. 5, should be subtracted from the data in Table No. 6 and the resulting figures placed in another table giving the percent coverage for all other fuel types. This will be Table No. 7 and should have the following title:

Table No. 7. The 0 - 15 Mile Net Seen-Area Coverage of all Fuel Types Except HH, by the Lookouts on the _____ National Forest, by Occurrence Zones.

Summary tables No. 4, 5, 6 and 7 are the results of the detection study and it is principally upon this data that any decisions regarding changes in the system will be based.

These tables are necessary to enable the planner to determine whether or not the detection system studied meets Regional Detection Standards.

In summary these tables are:

| Table Number | Purpose |
|---|---|
| 4 | To rank lookouts according to their Net Discovery Index and Summary of Total Coverage |
| 5 | Regional Fire Detection Standard A |
| 6 | Regional Fire Detection Standard C |
| 7 | Regional Fire Detection Standard B |

Part 5. Adjusting a Detection System

A. To Meet Replanning Objective Number One

To determine the efficiency of an existing fire detection system with respect to Regional Fire Detection Standards, it is necessary to study the results of previous calculations in Tables No. 4, 5, 6 and 7. If the standards are met then objective number one is also met. If this is the case, a summary of the coverage given by the existing system to each occurrence zone in the different fuel and risk groups should be made as demonstrated in Table No. 8 below.

Table No. 8. The 0 - 15 Mile Percent Coverage for the Primary Forest Detection System by Area Groups and Occurrence Zones Compared with Regional Standards.

| | Primary Lookout Percent Coverage by Occurrence Zones | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Zone 1 | | Zone 2 | | Zone 3 | | Zone 4 | | Zone 5 | | Total | |
| Group | S* | A** | S | A | S | A | S | A | S | A | S | A |
| All fuels | - | | - | | - | | - | | - | | - | |
| Slash & Brush Fuels | 85 | | 80 | | 70 | | 65 | | 55 | | - | |
| All other fuels | 75 | | 70 | | 65 | | 60 | | 50 | | - | |
| Man-Caused Risk Areas | 85 | | 80 | | 70 | | 65 | | 55 | | | |

*Minimum Regional Standard.
**Actual Coverage.

B. To Meet Replanning Objective Number Two

To make the proper additions to a detection system that does not meet Regional Fire Detection Standards. This objective does not apply to forests with detection systems which meet the Regional Standards.

Raising the area coverage given by a detection system is essentially a process of filling in areas lacking coverage until the system meets Regional Fire Detection Standards. Any one method, or various combinations of four methods are available to the planner to bring a fire detection system up to the Regional Standard. These methods are given below:

1. The addition of primary lookout stations and/or relocation of present primary lookouts. The use of this method is the only one of the four that results in a lookout system capable of giving continuous coverage. Since Fire Detection Standards for Region Three (see page 2) were developed on the basis of primary lookouts manned throughout the major part of the regular fire season, this method is considered the most desireable way to bring a Region Three Fire Detection System to standard and should be considered first.

2. The use of emergency type lookout points, trees or structures and/or lookout patrolmen.

3. Supplemental air detection designed to fill in areas lacking coverage.

4. The conversion to a scheduled air detection system supplemented by permanent lookouts.

Method Number One

The addition of primary lookout stations and/or relocation of present primary lookouts.

Step A

Visually study the seen-area maps of potential lookout points, with the objective of filling in areas needing coverage. (These maps are on file in either the Regional or Supervisor's offices). By this process it is usually possible to eliminate lookout points, which, if used, obviously would not improve the existing system.

Study the remaining maps in more detail in an effort to eliminate any others that may not be contributing sufficiently to the detection system. If none can be visually eliminated, then seen-area overlays should be prepared and statistical methods employed to determine any likely additions.

NOTE: Some likely lookout points may not have seen-area maps already prepared for them. If, based upon knowledge of the country, any of these locations have good possibilities as additions to the fire detection system, then ½ inch seen-area maps should be prepared for them.

Step B

The statistical methods to be used here are the same as those outlined under Parts 3 and 4.

The planner must place the most likely proposed lookout addition in its proper place in Table No. 4 and then recalculate the seen-areas and Discovery Indexes for all lookouts ranked below this addition. (It is not necessary at this point to insert the potential addition in Table 3, unless it becomes a permanent addition.)

It is necessary to proceed very cautiously here, since it is quite possible that the addition of a proposed lookout will reduce the Discovery Index of a lookout already in the system to such a low point that it may become necessary to drop it from the system. Of course, if the total coverage of the system is increased in the process an improvement has been made, if not, a loss is incurred. The cost of new construction should be carefully weighed against the benefits derived.

In many cases it will be possible to determine whether the system will be improved by the addition of a proposed lookout without going through all the detailed planimetering and calculations outlined under Parts 3 and 4. The careful use of the seen-area overlays of all lookouts which may be affected by the addition together with some quick planimetering and rough calculations will usually indicate whether or not the point has possibilities as an addition.

If the potential addition is not eliminated as a result of this procedure then the detailed procedure outlined in Parts 3 and 4 will have to be followed.

Step C

The next most likely addition is then placed in its proper place in Table 4 and the seen-areas and Discovery Indexes for all lookouts ranked below this addition recalculated as before.

This process is continued until, either the system meets Regional Fire Detection Standards, or the point of diminishing returns is reached, i. e., the point beyond which the cost of adding and manning additional lookouts throughout the regular fire season would outweigh the benefits derived from them. This point is reached at a Discovery Index of about 25.0. Any lookouts with a lower Discovery Index are doubtful additions and should be considered only as a last resort.

Note: It is recommended that, insofar as possible, administrative decisions which have to be made concerning lookout additions be considered during this filling in process. In this way an administrative "No" to an addition in advance may save much of the statistical work involved.

Data for all proposed lookouts which, as a result of following these steps, are to be added to the primary detection system, should be included in Table No. 3 and in summary Tables 4, 5, 6 and 7. It may

prove desirable to use two sets of these summary tables "before" and "after" so as to better illustrate theimprovement made in the coverage. An "after" table should also be made to go with Table No. 7.

These tables may indicate that the detection system in question has been brought up to Standards and Objective Number 2 has been compiled with. However, the point of diminishing returns may have been reached before meeting Regional Fire Detection Standards and further filling in will be necessary. These standards were made less than maximum, realizing that to attempt to achieve greater coverage with a permanent detection system could easily result in a costly, uneconomical one. Even so, it may be that on some forests even to achieve these standards would mean a costly system. When this is evident then there is no other course but to resort to methods 2, 3 or 4 below.

Method Number Two

The use of emergency type lookout points, trees, or structures and/or lookout patrolmen.

As stated above, the Regional Fire Detection Standards are based on less than maximum coverage with primary lookouts. It was intended that when additional coverage over and above the standard is desired it would be gained by the non-continuous emergency type of detection such as Methods 2 and 3. However, if the primary system does not meet the standard, then these met ods may have to be substituted for the permanent type to achieve the same coverage.

A standard procedure has not been developed to guide the planner toward the best selection of these methods. Therefore, the use of them is discussed in rather general terms.

These methods may be divided into two groups.

1. Those that are planned as a part of the regular organization and are financed from regular P&M funds.

2. Those that are strictly emergency measures, dependant upon conditions above normal and are financed from FF funds.

While the detection methods remain the same in both groups, the first group is recommended for use when the objective is to bring a detection system up to standard.

The reason for this being that we are still dealing with the regular detection system. Group 2 is intended for use only when above standard coverage is desired as for example when burning conditions are extreme. In addition, the first group being planned and regularly financed would provide steady employment and planned coverage every season. Even so, as a last resort Group 2 may be used.

Examples of Method two are discussed below.

1. Lookout Patrolmen (usually have suppression and prevention duties also). This method is already in use on at least one

forest in the region as a part of the regular organization. No doubt, the best application of this method is to bring the coverage of man-caused risk areas up to standard.

2. Emergency Type Lookouts. These may be any of several types listed below.

a. A lookout point or tree a short distance from a regular lookout. If applicable, this is a good method since manpower and fund requirements are at a minimum, especially if a man and wife combination is used on the Regular Lookout. A small expenditure may be needed to build the road or trail needed to reach the point.

b. A lookout point or tree near a regular fireman station. About as good as above except when fireman is away on fire the coverage provided is lost.

c. A lookout point or tree some distance from a regular fireman or lookout. No permanent quarters available. Man lives in tent or commutes. Not a desirable method for obvious reasons.

d. Scattered lag trees used only when lightning has occurred to obtain cross readings and/or cover unseen areas on certain danger days. Not a good method because it is very near an emergency measure.

e. Cooperators who may be located so as to see unseen areas. Detection provided would be intermittent.

f. Moving a fireman station to a high point to get detection may have good possibilities, but expense may be prohibitive.

Method Number Three.

Supplemental air detection designed to fill in areas lacking coverage.

Even though this method, if used correctly, would certainly provide needed additional coverage, its use, to bring a primary detection system up to standard, is not recommended. In most, if not all cases, substandard detection systems in Region Three will not be more than 10 - 15 percent below standard and to fill in the needed coverage with regular air-detection activities without abandoning some of the regular lookouts would be very costly. If regular air detection is to be considered as an answer to the detection problems on a forest with a substandard system, Method No. 4 should be considered.

Therefore, the use of air detection as a supplement to a regular detection system in Region Three is limited to unplanned emergency

type operations which depend upon conditions above normal and which are financed out of FF funds.

Note: Summary tables 4, 5, 6 and 7 indicate the net coverage of the primary detection system. Any of the above methods (2 and 3), if used, should not be included in them unless they are manned continuously throughout the major part of the regular fire season as are the primary lookouts. Rather they should be included in a separate table of their own patterned after tables 4, 5, 6 and 7. The data in these separate tables should be summarized and placed in a table.patterned after Table No. 8.

Method Number Four

The conversion to a scheduled air detection system supplemented by a few permanent lookouts.

Little is known of the practicability of planned air detection as applied to Region Three. However, information gained from the experiences of other Regions with these systems tells us that the application of this method of detection is limited. Many areas because of prevailing climatic conditions, high rates of spread, heavy use, high values, and high fire occurrence particularly man-caused, require constant observation to assure discovery of fires within allowable time limits.

Air detection as a planned operation cannot provide detection coverage within practical economic limits to meet discovery time requirements in such areas.

The chief use of planned air detection is:

1. In areas where lightning fires predominate, since these fires are better suited for air discovery than are man-caused fires.

2. In areas where it is not possible to plan adequate ground coverage at reasonable costs.

In these latter areas air detection as a supplement to an inadequate ground system may prove to be the only satisfactory, economical solution to the detection problems of a forest.

Even though there are many areas in this Region where lightning fires predominate, the potential use of aircraft for planned detection purposes on these areas is very limited. With few exceptions the forests in Region Three have or can have excellent and economical ground coverage with Primary Lookouts. Compared with other western regions we are very fortunate in this respect. For example, the fourteen lookouts on the Gila National Forest provided approximately 60 percent coverage of all occurrence zones and as replanned, 11 lookouts give 56 percent coverage of all occurrence zones. The percentages on some of the other forests in the Region will no doubt be higher.

Under these conditions the money to be saved by substituting air detection for a primary system that meets Regional Fire Detection Standards, is at a minimum and it is very doubtful that this will be done in Region Three. It may be that only in areas where it is not possible to provide adequate ground coverage at reasonable cost will planned air detection activities be used in Region Three.

If a planned air detection system is considered the answer to a forest's detection problem, the following factors should be weighed.

1. In every case the cost of air detection must compare favorably with that of any other system of detection that may be applied except that, when air detection is substituted for an existing ground system that meets Regional Fire Detection Standards, substantial savings must be shown.

2. The experiences with air detection of other Regions, show that trained observer in addition to the pilot is mandatory for successful planned air detection operations.

3. Remember that, with air-detection "most of our eggs are in one basket." Plane failure, adverse flying weather such as often occurs during extreme fire conditions, pilot fatigue and time out for regular airplane checks may occur just when detection is needed most.

4. In certain areas the abandonment of lookouts will also mean losing an initial attack fireman. This may upset and/or increase the cost of initial attack plans.

5. Night coverage as well as coverage during electrical storms cannot be gained by air detection.

If, after considering these factors it is decided to use air detection as a substitute for adequate ground detection or, if it is decided that adequate ground detection coverage cannot be obtained without a considerable additional capital outlay and large recurrent costs, then:

1. Select the fewest number of lookouts that will provide the most adequate detection for each dollar invested to areas of high occurrence, especially man-caused, high hazard and/or high value.

2. Then plan the air-detection part of the system so as to cover other lower hazard risk areas needing coverage until you are surethat Regional Fire Detection Standards are met.

In summary then, to raise the coverage given by a detection system the planner has these choices available.

1. The addition and/or relocation of primary lookouts.

2. The addition of emergency type lookout points, trees, or structures and/or lookout patrolmen. The patrolmen should

preferably be on a regularly financed basis but if necessary they could be on an emergency FF fund basis.

3. The use of supplemental air detection designed to fill in areas lacking coverage. (Not recommended)

4. The use of planned air detection supplemeneted by a few permanent lookouts.

The decisions which must be made in selecting the best one or a combination of the above methods, are based primarily on administrative and economic factors. The planner must weigh the costs involved against the long time benefits so as to achieve the best result when all things have been considered.

C. To Meet Replanning Objective Number Three

To make certain that a detection system meeting Regional Fire Detection Standards is economically efficient and if not, to make the proper adjustments to make it so.

To meet this objective it is necessary to analyze existing information to determine whether any lookouts can be safely eliminated for a system and still meet the Regional Fire Detection Standards as listed on page 2.

Those forests with detection systems that barely meet the standards and those that used means other than permanent lookouts to achieve the standards will have very little, if any, opportunity for increasing the economic efficiency of their systems by the elimination of lookouts. Any chance these forests may have in this respect is confined to the relocation of the present lookouts to improve coverage and this should have been done in meeting Replanning Objective Number Two.

Objective Number three is intended primarily for those forests which have primary detection systems which exceed the Regional Standards by a wide margin. Under these circumstances it may be possible to eliminate some lookouts from a system and still not decrease the coverage below the standards.

The procedure is outlined on the following pages.

Step 1

The data given in Summary Tables 4, 5, 6 and 7 form the base for any decisions which may be made concerning eliminations. The lookout with the lowest Discovery Index is considered first since, according to the tables, this lookout has the least chance of discovering fires. This lookout is mathematically removed from the system and the total percent coverages given by the remaining lookouts are recalculated for each of these tables to determine whether or not this lookout should be considered for elimination. Then the same thing is done for the lookout with the next highest Discovery Potential and so on. It should be remembered that all combinations should be considered for elimination.

For Example: The lowest lookout may be a potential elimination but so may be the next highest one if the lowest one is left in the system, etc. All possible combinations should be considered. Almost always lookouts which have a discovery potential below 50 will be the ones considered for eliminations.

To assist the planner in these decisions and to simplify this elimination process it is suggested that another set of tables, showing the cumulative percent coverage or individual percent coverage for each lookout listed in tables 4, 5, 6 and 7 by occurrence zones, be prepared. These will be Tables 9, 10, 11 and 12 a sample of which is shown below.

Table No. 12 Cumulative Percent of 0 - 15 Mile Net Coverage of all Fuel Types by the Lookouts on the Gila National Forest by Occurrence Zones.

| Lookouts in order of Selection | Fire Occurrence Zones | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Zone 2: 5.0 | % | Zone 3: 3.7 | % | Zone 4 : 1.4 | % | Zone 5 : .25 | % | | % |
| 1.Granite | 25,000 | 35.7 | 1,000 | 1.2 | 74,000 | 13.1 | 40,000 | 8.6 | 140,000 | 11.9 |
| 2.Eagle Pk | - | | 22,000 | 31.0 | 85,000 | 28.2 | 36,000 | 16.3 | 143,000 | 24.1 |
| Mogollon 3.Baldy | 7,000 | 45.7 | 7,000 | 40.5 | 33,000 | 34.1 | 21,000 | 21.0 | 68,000 | 29.9 |
| 4.Signal Pk. | 13,000 | 64.3 | - | | 22,000 | 38.0 | 18,000 | 24.6 | 53,000 | 34.4 |
| 5. Black Mtn. | 1,000 | 65.7 | 4,000 | 45.9 | 35,000 | 44.2 | 31,000 | 31.3 | 71,000 | 40.5 |
| 6.Bearwallow | - | | 4,000 | 51.4 | 29,000 | 49.4 | 1,000 | 31.5 | 34,000 | 43.4 |
| 7.Lookout | - | | 10,000 | 64.9 | 2,000 | 49.7 | 42,000 | 40.5 | 54,000 | 47.9 |
| 8.Spring Mtn. | 1,000 | 67.1 | 5,000 | 71.6 | 14,000 | 52.2 | 11,000 | 42.8 | 31,000 | 50.1 |
| 9. Reeds Pk. | - | | - | | 19,000 | 55.6 | 12,000 | 45.4 | 31,000 | 53.2 |
| 10.Negrito Mtn. | - | | 1,000 | 73.0 | 13,000 | 57.9 | - | | 14,000 | 54.4 |
| 11.Hillsboro | - | | - | | 13,000 | 60.2 | 10,000 | 47.5 | 23,000 | 56.4 |
| 12.Holt Mtn. | 2,000 | 70.0 | 2,000 | 75.6 | - | | 5,000 | 48.6 | 9,000 | 57.2 |
| 13.Boiler | - | | 1,000 | 77.0 | 8,000 | 61.6 | 13,000 | 51.4 | 22,000 | 59.0 |
| 14.Diamond | - | | 1,000 | 78.4 | 5,000 | 62.5 | 3,000 | 52.0 | 9,000 | 59.8 |
| 15.Grouse | - | | - | | 2,000 | 62.9 | 1,000 | 52.2 | 3,000 | 60.0 |
| Total seen Area | 49,000 | 70.0 | 58,000 | 78.4 | 354,000 | 62.9 | 244,000 | 52.2 | 705,000 | 60.0 |
| Total to be seen | 70,000 | | 74,000 | | 563,000 | | 467,000 | | 1,174,000 | |

As shown in the sample, the percent coverage, by occurrence zones is calculated for each lookout and made cumulative in the order in which they appear. Of course the total percent coverage should be the same for both sets of tables.

No doubt the planner has already observed that the economic law of diminishing returns is very evident in these percent tables. For example: In the sample shown, the total coverage given by the first 8 lookouts is 50.1% and that added by 7 more lookouts is only 9.9%. The same trend is true for the coverage within each occurrence zone.

By using these percent tables, the lookouts which can be eliminated from the system and still have the system meet all the standards, can easily be determined.

> Caution: The removal of a lookout from the tables will not affect the coverage data for any higher ranked lookout, but it may affect the net coverage data given by a lower ranked lookout.

When all possible eliminations have been determined, a list should be made of them and included in the final report.

Step 2

It is now necessary to analyze the effect the removal of these possible eliminations will have on the detection efficiency of the system. Even though a lookout may be eliminated from a system statistically, it may be desirable to leave it in the system for other reasons. These reasons are many and all of them cannot be foreseen. Some of the more important ones are discussed below. These and any other factors involved should be carefully considered before elimination can be justified.

A. What does the lookout see that is not seen by any other lookout? Is this area made up of a few large pieces or many small ones? Even though a detection system will meet standards after the elimination of a lookout, to do so may result in a rather large area receiving no coverage at all.

B. Shat is the fuel type on this area? Rate of spread? Resistance to control? Occurrence rate, lightning and man-caused?

C. Is this area seen by other lookouts beyond their 15 mile zone? If so, how much is seen, from how many lookouts and from how far? When much of a lookout's net percent contribution to a system is seen by other lookouts in their 15 - 20 mile zone the argument for elimination is strengthened.

D. Is this area inaccessible? It is more important to have higher coverage of inaccessible areas than of accessible ones in the same occurrence zone.

E. Is most of the lookout's coverage in a high occurrence zone or in a low one?

F. How much cross reading advantage will be lost if the lookout is abandoned? Cross readings are important in inaccessible areas when smokejumpers are not available.

G. Are the lookout structures and/or ground improvements in a state of disrepair?

H. Is the lookout accessible by road? Can it be manned quickly?

I. Does the lookout see important areas on other forests? In some cases a lookout may be more important to another forest than it is to its own.

J. Is the lookout point needed for initial attack purposes? This is one of the most important of the other factors to consider. In some cases the initial attack need may be equal to or greater than the detection need which would make elimination doubtful.

K. Is the lookout point needed to fulfill radio communication objectives? Again an important point, the removal of such stations may greatly reduce the fficiency of a radio communication system.

L. Is the lookout needed for I and " or prevention purposes?

The careful consideration of the above reasons should result in a decision to either keep the lookouts in question in the primary detection system or to eliminate them. If it is decided to eliminate the lookouts, there are three degrees of elimination which may be selected.

1. The permanent elimination of the lookout from the system. If the planner is not sure of this approach it may be possible to eliminate a lookout on a part time basis using either or both of approaches 2 and 3 until it is definitely known that permanent elimination is justified.

2. Man the station for initial attack only. This results in detection coverage while the man is there and a loss of it when he is sent to fires. There would be no need to double-man stations of this type from regular funds to gain continuous detection. A man and wife combination would improve this since she could be paid for detection when the fireman is gone as burning conditions warrant. Stations of this type would be classed "Primary Fireman, Secondary Lookout".

3. Man the station on an emergency basis only. For example, on extreme danger days or when lightning is forecast or to obtain cross readings when lightning has occurred. Stations of this type would be classed as "Emergency Lookouts" and would not be financed out of regular funds. This approach should be weighed against the use of Emergency Air Detection.

Step 3

The conclusions reached for each of the "Possible Eliminations" determined in Step 1 should be presented and the reasons discussed for both those eliminated and for those which should remain in the permanent system. Tables 3, 4, 5, 6, 7 and 8 should be revised so that only the future "Primary Lookouts" appear in them. The coverage available before the eliminations were made should be preserved.

In the Gila sample tables referred to throughout this report, four lookouts were eliminated. These were Grouse Mountain, Diamond Peak, Boiler Peak and Negrito Mountain. The final classification of these lookouts was as follows:

Grouse - Emergency only.
Diamond - Emergency only.
Boiler - Primary Fireman - Secondary Lookout
Negrito - Emergency only.

A summary table similar to the following sample may be prepared if desired.

Table 13. Comparison of the 0 - 15 mile Percent Coverage of All Fuel Types by 15 lookouts with that of 11 lookouts. Gila N. F.

| | Areas & Percent Coverage | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Zone 2: | | Zone 3: | | Zone 4 : | | Zone 5 : | | Total : | |
| | Acres: | % | Acres: | % | Acres : | % | Acres : | % | Acres : | % |
| All 15 Lookouts | 49,000: | 70.0: | 58,000: | 78.4: | 354,000: | 62.9: | 244,000: | 52.2: | 705,000: | 60.0 |
| Less Grouse | 49,000: | 70.0: | 58,000: | 78.4: | 352,000: | 62.5: | 243,000: | 52.0: | 702,000: | 59.8 |
| Less Diamond | 49,000: | 70.0: | 57,000: | 77.0: | 347,000: | 61.6: | 240,000: | 51.4: | 693,000: | 59.0 |
| Less Boiler | 49,000: | 70.0: | 56,000: | 75.6: | 339,000: | 60.2: | 227,000: | 48.6: | 671,000: | 57.2 |
| Less Negrito | 49,000: | 70.0: | 55,000: | 74.2: | 326.000: | 57.9: | 227,000: | 48.6: | 657,000: | 56.0 |
| Difference | None : | | 3,000: | 4.2: | 28,000: | 5.0: | 17,000: | 3.6: | 48,000: | 4.0 |

Notice that even though the four lookouts were not permanently abandoned the detection coverage is calculated as if they were. Again Regional Fire Detection Standards should be met by the "Permanent Continuous Detection System".

D. To Meet Replanning Objective Number Four

To determine as accurately as possible the best combination of primary and if necessary, emergency type lookouts to give the coverage desired at each danger rating during the different fire seasons.

It is well known that all permanent lookouts do not have to be manned continuously during Pre or Post season and at times not even during the regular fire season to give adequate detection coverage. To properly

consider the factors involved in meeting this objective the discussion of them is divided into two parts: Regular Season and Pre and Post Season.

Regular Season:

Unless peculiar circumstances (sickness, snow, fire, etc.) make it impossible in Region Three all regular lookouts will be manned at all times on High and Extreme danger days during the Regular Fire Season.

On Moderate danger days it is permissible to reduce total coverage to provide days off, to comply with the forty hour week, or to conserve regular funds. If reduced manning is to be done on moderate danger days during the Regular-Season the following points should be considered.

A. Provide the best coverage to high occurrence areas, areas of man-caused risk, and areas of high hazard (slash, etc.) and reduce the coverage on other areas.

B. Do not leave large holes in the coverage by not manning two adjacent lookouts.

C. When lightning has occurred and some lookouts are not manned, fly the area covered by these lookouts or put them up whichever is cheaper and more convenient.

Emergency Manning: When burning conditions become extreme and coverage greater than that given by the regular system is desired, then emergency detection methods as described in Part 5, Section B, may be used until burning conditions justify their removal.

Pre and Post Season

Except under unusual conditions, pre and post season, full coverage by the regular detection system will not be needed. When planning pre and post season detection manning the following should be considered.

1. Use the "High Coverage" lookouts first and add the others as burning conditions warrant.

2. If high country is present, lookouts covering these areas may not need to be manned as soon as those covering lower country.

3. Correlate pre and post season detection with expected occurrence. If fires rarely occur in say December, January and February there is probably no need to man any lookouts or at best to man only 1 or 2 high coverage ones. If lightning fires predominate air detection may be used during these low occurrence periods after lightning has occurred or TSI and other similar personnel may be used to man accessible lookouts for short periods of time.

4. During hunting seasons good coverage of heavily hunted areas is desired.

It is suggested that an "unseen area map" be made of the forest for emergency air detection use, so that:

1. When necessary to fly for lightning fires the flight can concentrate on areas of high lightning occurrence that are blind to the regular detection system.

2. When necessary to fly for man-caused fires the flight can concentrate on areas of high man-caused occurrence blind to the regular detection system.

Obviously it would be a waste of time and money to scout areas already seen by lookouts. These maps will tell the observer where to look to the most good. Another use would be to show the best areas to locate lookout patrolmen to provide emergency detection.

## Part 6. Final Report Outline

The general outline to be followed for the final report of this study is as follows:

### Part I Analysis of the Present Detection System

Include

A. A description of the present system including a table of first discoveries if desired.

B. An explanation and short discussion of Tables 2, 3, 4, 5, 6 and 7.

### Part II Recommendations for Lookout Additions

Include

All pertinent data and methods used to meet Replanning Objective Number 2.

### Part III Recommendations for Lookout Eliminations

A. Based on Detection only:

Include list of "potential eliminations" and reason for or against the elimination of each of them based on detection only.

B. Based on Other than Detection

Include reasons for or against elimination based on factors other than detection.

Part IV Conclusions

Include

Conclusions reached in meeting Replanning Objectives 1 - 4 and all tables and data necessary to illustrate these conclusions.

Part V Miscellaneous

Include

Maps used in making the study. The "Unseen" Area maps. Miscellaneous discussion and tables as are deemed necessary.

In general, the planner should show three things in the final report.

1. Data pertaining to the existing detection system.

2. Data pertaining to the recommended replanned detection system.

3. The basis and reasons for the recommendations. Be sure to make these points clear enough so that future foresters can follow them.